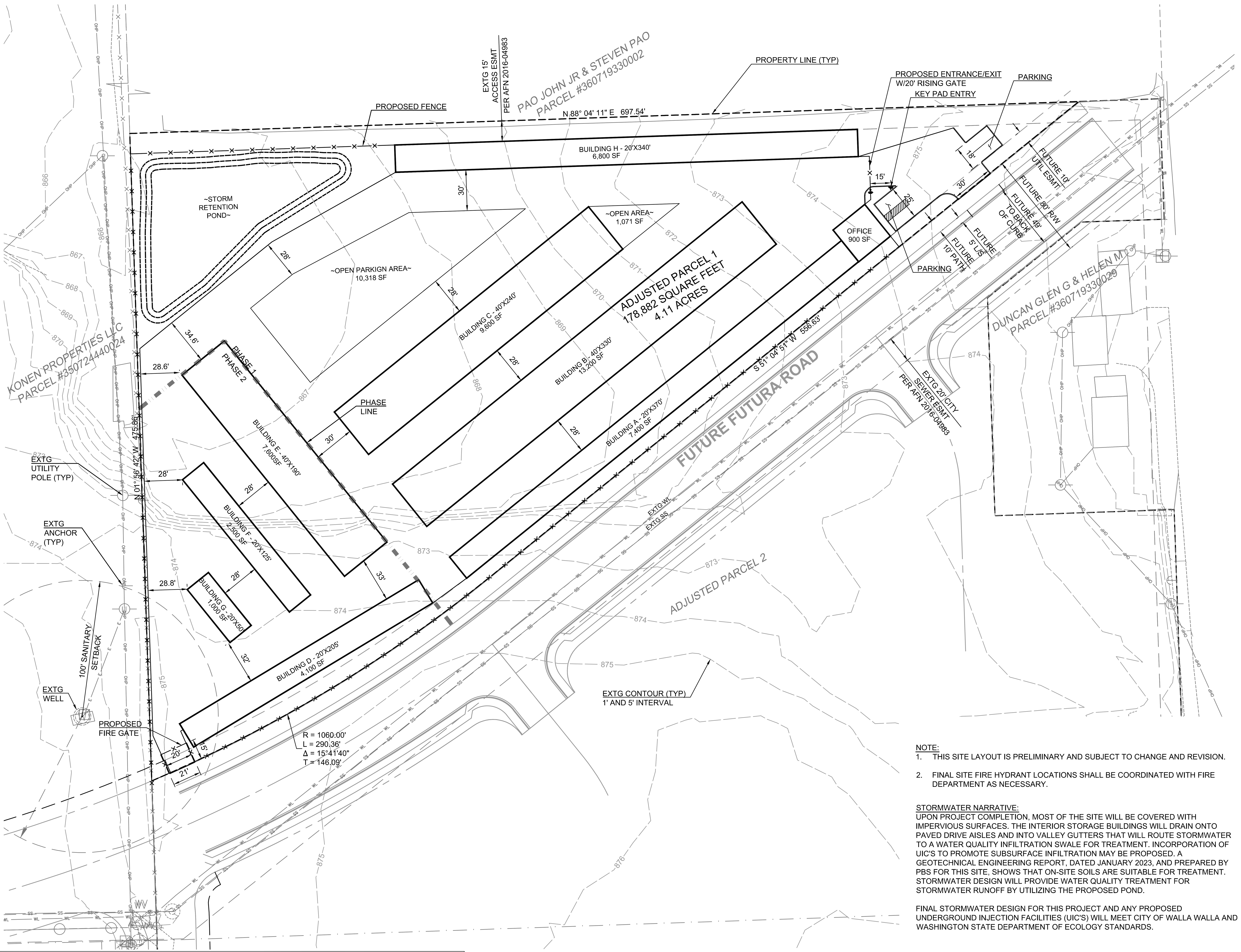
Appendix A

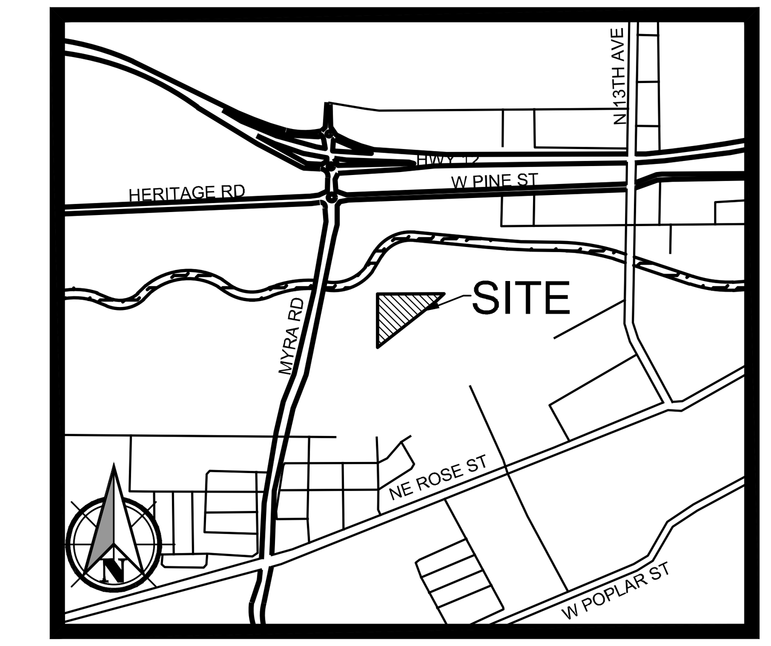
SPRC and SEPA Attachments

Preliminary Site Plan
Geotechnical Engineering Report
Cultural Resources Report

MYRA ROAD MINI-STORAGE FACILITY

SOUTHWEST 1/4 OF THE SOUTHWEST 1/4 OF SECTION 19, TOWNSHIP 7 NORTH, RANGE 36 EAST, W.M.





VICINITY MAP

NOT TO SCALE

Scale 1" = 40'

0 20 40 80

OWNER/DEVELOPER/APPLICANT:
HYPERION LLC
ATTN. CINDY MOON & TREVOR MOON
PO BOX 49
MILTON-FREEWATER, OR 97862
(509) 200-1606

ENGINEER:
PBS ENGINEERING AND ENVIRONMENTAL, INC.
MICHAEL MELDER, P.E.
5 NORTH COLVILLE, SUITE 200
WALLA WALLA, WA 99362
(509) 956-3026

SITE AREAS:
BUILDING PHASE 1: 37,000 S.F
BUILDING PHASE 2: 15,200 S.F
PAVEMENT AREA: 2.06 A.C
OFFICE SPACE: 900 S.F.

SURVEYOR:
PBS ENGINEERING AND ENVIRONMENTAL, INC.
GREG E. FLOWERS, PLS
5 NORTH COLVILLE, SUITE 200
WALLA WALLA, WA 99362
(509) 956-3026

LEGAL DESCRIPTION NOTE:
ADJUSTED PARCEL 1 (4.11 ACRES) OF PROPERTY DESCRIBED BELOW IS BEING DEVELOPED FOR THIS SITE PLAN.

ADJUSTED PARCEL 1 LEGAL DESCRIPTION:
A PARCEL OF LAND LOCATED IN THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 19 IN TOWNSHIP 7 NORTH, RANGE 36 EAST OF THE WILLAMETTE MERIDIAN, CITY OF WALLA WALLA, COUNTY OF WALLA WALLA, STATE OF WASHINGTON, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHWEST CORNER OF SAID SECTION 19;

THENCE, ALONG THE WEST LINE OF THE SOUTHWEST QUARTER OF SAID SECTION 19, N01°56'42"W A DISTANCE OF 117.33 FEET TO THE TRUE POINT OF BEGINNING FOR THIS DESCRIPTION;

THENCE, CONTINUING ALONG SAID WEST LINE, N01°56'42"W A DISTANCE OF 475.86 FEET TO THE NORTHWEST CORNER OF ADJUSTED PARCEL 2 AS SHOWN ON THE RECORD OF SURVEY RECORDED AS AUDITOR'S FILE NUMBER 2016-04983 IN RECORDS OF WALLA WALLA COUNTY, WASHINGTON;THENCE, ALONG THE NORTH LINE OF SAID ADJUSTED PARCEL 2, N88°04'11"E A DISTANCE OF 697.54 FEET;THENCE, LEAVING SAID NORTH LINE, S51°04'51"W A DISTANCE OF 556.63 FEET;THENCE WITH A CURVE TURNING TO THE RIGHT WITH AN ARC LENGTH OF 290.36 FEET, WITH A RADIUS OF 1060.00 FEET, WITH A CHORD BEARING OF S58°55'38"W, WITH A CHORD LENGTH OF 289.45 FEET, WITH A DELTA ANGLE OF 15°41'40", TO THE POINT OF BEGINNING, HAVING AN AREA OF 178,882 SQUARE FEET, 4.11 ACRES, MORE OR LESS.

LEGEND

—— WL —— WL —— WL —— WL ——	EXISTING WATER MAIN
—— SS —— SS —— SS —— SS ——	EXISTING SEWER MAIN
—— OHP —— OHP —— OHP ——	EXISTING OVERHEAD POWER LINE
—— E —— E —— E —— E ——	EXISTING ELECTRICAL LINE
—x—x—x—x—x—	EXISTING FENCE LINE
	EXISTING RIGHT OF WAY
	EXISTING LOT LINE
	EXISTING ROADWAY CENTERLINE
	EXISTING CURB & GUTTER
	PROPOSED WATER LINE
	PROPOSED SEWER LINE
—x—x—x—x—x—	PROPOSED FENCE LINE
	PROPOSED PROPERTY LINE
	PROPOSED BUILDING FOOTPRINT
	FUTURE RIGHT OF WAY
	FUTURE CENTERLINE

NOTE:
1. THIS SITE LAYOUT IS PRELIMINARY AND SUBJECT TO CHANGE AND REVISION.
2. FINAL SITE FIRE HYDRANT LOCATIONS SHALL BE COORDINATED WITH FIRE DEPARTMENT AS NECESSARY.

STORMWATER NARRATIVE:
UPON PROJECT COMPLETION, MOST OF THE SITE WILL BE COVERED WITH IMPERVIOUS SURFACES. THE INTERIOR STORAGE BUILDINGS WILL DRAIN ONTO PAVED DRIVE AISLES AND INTO VALLEY GUTTERS THAT WILL ROUTE STORMWATER TO A WATER QUALITY INFILTRATION SWALE FOR TREATMENT. INCORPORATION OF UIC'S TO PROMOTE SUBSURFACE INFILTRATION MAY BE PROPOSED. A GEOTECHNICAL ENGINEERING REPORT, DATED JANUARY 2023, AND PREPARED BY PBS FOR THIS SITE, SHOWS THAT ON-SITE SOILS ARE SUITABLE FOR TREATMENT. STORMWATER DESIGN WILL PROVIDE WATER QUALITY TREATMENT FOR STORMWATER RUNOFF BY UTILIZING THE PROPOSED POND.

FINAL STORMWATER DESIGN FOR THIS PROJECT AND ANY PROPOSED UNDERGROUND INJECTION FACILITIES (UIC'S) WILL MEET CITY OF WALLA WALLA AND WASHINGTON STATE DEPARTMENT OF ECOLOGY STANDARDS.

PRELIMINARY
SUBJECT TO AGENCY REVIEW
NOT FOR CONSTRUCTION

PBS Engineering and Environmental Inc.
5 N Colville St, Ste 200
Walla Walla, WA 99362
509.956.3026
pbsusa.com

PRELIMINARY SITE PLAN FOR:

MYRA ROAD MINI-STORAGE FACILITY

A SITE LOCATED IN THE CITY OF WALLA WALLA, WA

811 Know what's below. Call before you dig.

DESIGNED:	DCC/SG
CHECKED:	SG
JAN 2023	67926.000
SHEET ID	

SHEET 1 OF 1

Geotechnical Engineering Report

Myra Road Mini-Storage Facility
Offner Road
Walla Walla, Washington

Prepared for:

Hyperion LLC
PO Box 49
Milton-Freewater, Oregon 97862

January 24, 2023
PBS Project 67926.000

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Geotechnical Engineering Report

Myra Road Mini-Storage Facility
Offner Road
Walla Walla, Washington

Prepared for:
Hyperion LLC
PO Box 49
Milton-Freewater, Oregon 97862

January 24, 2023
PBS Project 67926.000

Prepared by:

January 24, 2023

Clint Nealey, PE
Project Geotechnical Engineer

Reviewed by:

Saiid Behboodi, PE, GE (OR)
Principal/Geotechnical Engineer

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Supporting Data

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FIGURES

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1 INTRODUCTION

1.1 General

This report presents results of PBS Engineering and Environmental Inc. (PBS) geotechnical engineering services for the proposed mini storage facility located on Offner Road in Walla Walla, Washington (site). The general site location is shown on the Vicinity Map, Figure 1. The locations of PBS' explorations in relation to existing site features are shown on the Site Plan, Figure 2.

1.2 Purpose and Scope

The purpose of PBS' services was to develop geotechnical design and construction recommendations in support of the planned mini storage facility. This was accomplished by performing the following scope of services.

1.2.1 Literature and Records Review

PBS reviewed various published geologic maps of the area for information regarding geologic conditions and hazards at or near the site.

1.2.2 Subsurface Explorations

PBS excavated eight test pits within the proposed development footprint to depths of up to 10 feet below the existing ground surface (bgs). The test pits were logged and representative soil samples collected by a member of the PBS geotechnical engineering staff. Interpreted test pit logs are included as Figures A1 through A8 in Appendix A, Field Explorations.

1.2.3 Field Infiltration Testing

Two falling-head infiltration tests were completed in test pits TP-1 and TP-2 at depths of approximately 4 feet bgs. Infiltration testing was monitored by PBS geotechnical engineering staff. Soil samples collected from the infiltration test locations were analyzed for cation exchange capacity.

1.2.4 Soils Testing

Soil samples were returned to our laboratory and classified in general accordance with the Unified Soil Classification System (ASTM D2487) and/or the Visual-Manual Procedure (ASTM D2488). Laboratory tests included natural moisture contents and grain-size analyses. Laboratory test results are included in the exploration logs in Appendix A, Field Explorations; and in Appendix B, Laboratory Testing.

1.2.5 Geotechnical Engineering Analysis

Data collected during the subsurface exploration, literature research, and testing were used to develop site-specific geotechnical design parameters and construction recommendations.

1.2.6 Report Preparation

This Geotechnical Engineering Report summarizes the results of our explorations, testing, and analyses, including information relating to the following:

- Field exploration logs and site plan showing approximate exploration locations
- Laboratory test results
- Infiltration test results
- Groundwater levels and considerations
- Liquefaction potential
- Shallow foundation recommendations:
    - Minimum embedment

  - Allowable bearing pressure
  - Estimated settlement
  - Sliding coefficient
- Earthwork and grading, cut, and fill recommendations:
  - Structural fill materials and preparation, and reuse of on-site soils
  - Utility trench excavation and backfill requirements
  - Wet weather considerations
  - Temporary and permanent slope inclinations
- Seismic design criteria in accordance with the current International Building Code (IBC) with state of Washington amendments
- Slab and pavement subgrade recommendations
- Asphalt concrete (AC) pavement section recommendations

1.3 Project Understanding

PBS understands the approximately 4.4-acre subject property will be mass-graded for construction of mini storage buildings. Development will include new utility installation, paving, and construction of a stormwater management pond in the northwest corner. PBS assumes one-story structures will be built using metal framing or similarly lightweight materials supported on a linear footing or thickened-edge slab.

2 SITE CONDITIONS

2.1 Surface Description

The approximately 4.4-acre triangular site is bordered on all sides by agricultural or undeveloped land. Publicly available imagery indicates portions of the parcel to the west were used for undocumented landfilling. Mill Creek is located approximately 250 feet to the northwest. The site slopes to the northwest with a gentle northwestern trending trough that runs through the center of the site. Review of available Washington Department of Natural Resources (WADNR) LiDAR data indicate site surface elevations range from approximately 875 feet on the eastern and southern corners of the site, to approximately 870 feet in the center of the southeastern boundary, to approximately 865 feet in the northwestern corner (NAVD 88; WADNR, 2023).

2.2 Geologic Setting

2.2.1 Regional Geology

The site is located within the Walla Walla Valley along the southern margin of the Columbia Basin, a geologic province of eastern Washington located north of the Deschutes-Columbia Plateau and Blue Mountains Provinces of Oregon and Washington. The Columbia Basin is composed primarily of volcanic basement rocks of the Columbia River Basalt Group subdivided into smaller recognizable flows and members that are overlain by Quaternary deposits (Derkey et al., 2006). These older flood basalts were generated by volcanic eruptions in eastern Oregon, eastern Washington, and western Idaho between 16.7 million years ago (Ma) and 5.5 Ma (Reidel, 2004).

The southwestern extent of the Columbia Basin consists of the Yakima fold and thrust belt (YFTB) sub province characterized by fault-bound linear ridge lines. The easternmost extent of the YFTB is bounded by the Horse Heaven Hills Anticline and Wallula fault system, which extend into Walla Walla Valley. The Horse Heaven Hills Anticline forms a topographic high point and narrow water gap along the southern extent of the Columbia Basin and Deschutes-Columbia Plateau, which has been continuously incised by the Columbia River throughout the Quaternary (Reidel and Fecht, 1994; Schuster, 1994).

Throughout the Pleistocene, outburst flood waters from Glacial Lake Missoula resulted in rapid sedimentation as floodwaters ponded behind the water gap. Slowing flood waters blanketed the basin with slackwater flood deposits over much of the low-lying areas, as well as created extensive gravel bar complexes near the Columbia River. Reworking of fine-grained outburst flood sediments by aeolian processes has created deposits of loess in elevated areas that were not directly affected by glacial floodwaters.

2.2.2 Local Geology

The site is mapped as underlain by Holocene-age alluvium (Derkey et al., 2006). This material consists of discontinuous and unconsolidated deposits of silt, sand, and gravel found near streams and on the floodplains of adjacent rivers.

2.3 Subsurface Conditions

The site was explored by excavating eight test pits, designated TP-1 through TP-8, to depths of up to 10 feet bgs. The excavation was performed by Eagon Excavating & Construction Services, LLC, of Walla Walla, Washington, using a CAT 305.5E excavator outfitted with a 36-inch-wide smooth bucket.

PBS has summarized the subsurface units as follows:

SILT with Sand to Sandy SILT (ML):	Dark brown silt with varying amounts of fine-grained sand was encountered just below the ground surface in all test pits. The silt exhibited low plasticity and was generally firm based on foundation probe resistance, though soft soils were observed in test pits TP-2 and TP-4. The material extended to variable depths and transitioned to gravel in test pit TP-6 at 18 inches bgs. Test pits TP-3, TP-4, and TP-8 terminated in silt.
GRAVEL to GRAVEL with Silt (GP-GM):	Poorly graded gravel was encountered below the silt in test pits TP-1, TP-2, and TP-5 through TP-7. The basalt gravel was rounded and intermixed with fine- to coarse-grained sand and cobbles. Gravel extended to the termination depth where encountered.

2.4 Groundwater

Static groundwater was not encountered during our explorations. Based on a review of regional groundwater logs available from the Washington State Department of Ecology, we anticipate that the static groundwater level is present at a depth below 10 feet bgs. Please note that groundwater levels can fluctuate during the year depending on climate, irrigation season, extended periods of precipitation, drought, and other factors.

2.5 Infiltration Testing

PBS completed two open-hole, falling-head infiltration tests in test pits TP-1 and TP-2 at a depth of approximately 4 feet bgs. The infiltration testing was conducted in general accordance with the Stormwater Management Manual for Eastern Washington procedures. The unlined test pits were filled with water to achieve a minimum 1-foot-high column of water. After a period of saturation, the height of the water column in the test pits was measured initially and at regular, timed intervals. Results of field infiltration testing are presented in Table 1.

Table 1. Infiltration Test Results

Test Location	Depth (feet bgs)	Field Measured Infiltration Rate (in/hr)	Soil Classification
TP-1	4.0	0.9	Sandy SILT (ML)
TP-2	4.0	0.7	SILT with Sand (ML)

The infiltration rates listed in Table 1 are not permeabilities/hydraulic conductivities, but field-measured rates, and do not include correction factors related to long-term infiltration rates. The design engineer should determine the appropriate correction factors to account for the planned level of pre-treatment, maintenance, vegetation, siltation, etc. Field-measured infiltration rates are typically reduced by a minimum factor of 2 to 4 for use in design.

Soil types can vary significantly over relatively short distances. The infiltration rates noted above are representative of one discrete location and depth. Installation of infiltration systems within the layer the field rate was measured is considered critical to proper performance of the systems.

2.5.1 Cation Exchange Capacity

The ability for soils to filter or adsorb pollutants through infiltration above the groundwater table depends on several factors, including grain size, the amount of organic matter, and cation exchange capacity (CEC). The CEC provides a measure of the soil’s ability to remove pollutants by chemical reaction. Section 5.6.17 of the SWMMEW classifies the treatment capacity of these geologic materials as high, medium, low, or none; criteria for these classifications are summarized in Table 5.21 of the SWMMEW.

PBS collected soil samples from the infiltration test pits for laboratory analysis. Results of CEC and organic content analysis are provided in Table 2.

Table 2. Cation Exchange Capacity Test Results

Test Location	Depth (feet bgs)	pH	Organic Matter (%)	Cation Exchange Capacity (meq/100g)
TP-1	4	7.9	3.4	20.0
TP-2	4	7.5	3.1	19.1

3 CONCLUSIONS AND RECOMMENDATIONS

3.1 Geotechnical Design Considerations

The subsurface conditions encountered in our explorations generally consisted of silt intermixed with varying amounts of fine-grained sand overlying gravel. Based on our observations and analyses, conventional foundation support on shallow spread footings is feasible for the proposed mini storage facility. Excavation with conventional equipment is feasible at the site.

The grading and final development plans for the project had not been completed when this report was prepared. Once completed, PBS should be engaged to review the project plans and update our recommendations as necessary.

3.2 Shallow Foundations

Shallow spread footings bearing on compacted native silt or approved structural fill may be used to support loads associated with the proposed development, provided the recommendations in this report are followed. Footings should not be supported on undocumented fill. Over excavation of soft soils and replacement with compacted structural fill may be required in some areas. PBS' geotechnical engineering group should be engaged to evaluate all subgrades prior to foundation construction. We recommend compacting all exposed subgrades below foundations, slabs, and pavement prior to pouring concrete or placing base rock.

3.2.1 Minimum Footing Widths and Design Bearing Pressure

Continuous wall and isolated spread footings should be sized in accordance with local codes using a maximum allowable bearing pressure of 2,000 pounds per square foot (psf). This is a net bearing pressure and the weight of the footing and overlying backfill can be disregarded in calculating footing sizes. The recommended allowable bearing pressure applies to the total of dead plus long-term live loads. Allowable bearing pressures may be increased by one-third for seismic and wind loads.

Footings will settle in response to column and wall loads. Based on our evaluation of the subsurface conditions and our analysis, we estimate post-construction settlement will be less than 1 inch for the column and perimeter foundation loads. Differential settlement will be on the order of one-half of the total settlement.

3.2.2 Footing Embedment Depths

PBS recommends that all footings be founded a minimum of 24 inches below the lowest adjacent grade. The footings should be founded below an imaginary line projecting upward at a 1H:1V (horizontal to vertical) slope from the base of any adjacent, parallel utility trenches or deeper excavations.

3.2.3 Footing Preparation

Excavations for footings should be carefully prepared to a neat and undisturbed state and compacted until firm. A representative from PBS should confirm suitable bearing conditions and evaluate all exposed footing subgrades. Observations should also confirm that loose or soft materials have been removed from new footing excavations and concrete slab-on-grade areas. Localized deepening of footing excavations may be required to penetrate loose, wet, or deleterious materials.

PBS recommends a layer of compacted, crushed rock be placed over the footing subgrades to help protect them from disturbance due to foot traffic and the elements. Placement of this rock is the prerogative of the contractor; regardless, the footing subgrade should be in a dense or stiff condition prior to pouring concrete. Based on our experience, approximately 4 inches of compacted crushed rock will be suitable beneath the footings.

3.2.4 Lateral Resistance

Lateral loads can be resisted by passive earth pressure on the sides of footings and grade beams, and by friction at the base of the footings. A passive earth pressure of 200 pounds per cubic foot (pcf) may be used for footings confined by native soils and new structural fills. The allowable passive pressure has been reduced by a factor of two to account for the large amount of deformation required to mobilize full passive resistance. Adjacent floor slabs, pavements, or the upper 12-inch depth of adjacent unpaved areas should not be considered when calculating passive resistance. For footings supported on native soils or new structural fills, use a coefficient of friction equal to 0.35 when calculating resistance to sliding. These values do not include a factor of safety (FS).

3.3 Floor Slabs

Satisfactory subgrade support for building floor slabs can be obtained from the native silt or approved structural fill subgrade prepared in accordance with our recommendations presented in the Site Preparation, Wet/Freezing Weather and Wet Soil Conditions, and Imported Granular Materials sections of this report. A minimum 6-inch-thick layer of imported granular material should be placed and compacted over the prepared subgrade. Imported granular material should be composed of crushed rock or crushed gravel that is relatively well graded between coarse and fine, contains no deleterious materials, has a maximum particle size of 1 inch, and has less than 5% by dry weight passing the US Standard No. 200 Sieve.

Floor slabs supported on a subgrade and base course prepared in accordance with the preceding recommendations may be designed using a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci).

3.4 Seismic Design Considerations

3.4.1 Code-Based Seismic Design Parameters

The current seismic design criteria for this project are based on the 2018 International Building Code with State of Washington amendments. Based on subsurface conditions encountered at the site, Site Class D is appropriate for use in design. The seismic design criteria, in accordance with the 2018 IBC, are summarized in Table 3.

Table 3. 2018 IBC Seismic Design Parameters

Parameter	Short Period	1 Second
Maximum Credible Earthquake Spectral Acceleration	S_s = 0.40 g	S_1 = 0.14 g
Site Class	D	
Site Coefficient	F_a = 1.48	F_v = 2.32
Adjusted Spectral Acceleration	S_{MS} = 0.60 g	S_{M1} = 0.32 g
Design Spectral Response Acceleration Parameters	S_{DS} = 0.40 g	S_{D1} = 0.22 g

g= Acceleration due to gravity

3.4.2 Liquefaction Potential

Liquefaction is defined as a decrease in the shear resistance of loose, saturated, cohesionless soil (e.g., sand) or low plasticity silt soils, due to the buildup of excess pore pressures generated during an earthquake. This results in a temporary transformation of the soil deposit into a viscous fluid. Liquefaction can result in ground settlement, foundation bearing capacity failure, and lateral spreading of ground.

Based on a review of the Washington Division of Geology and Earth Resources, the site is shown as having a moderate to high liquefaction hazard. Based on the depth to dense gravel and lack of groundwater observed in our explorations, our current opinion is that the risk of structurally damaging liquefaction settlement at the site is low.

3.5 Temporary and Permanent Slopes

All temporary cut slopes should be excavated with a smooth-bucket excavator, with the slope surface repaired if disturbed. In addition, upslope surface runoff should be rerouted to not run down the face of the slopes. Equipment should not be allowed to induce vibration or infiltrate water above the slopes, and no surcharges are allowed within 25 feet of the slope crest.

Permanent cut and fill slopes up to 10 feet high can be inclined at 2H:1V in native silty sand or compacted structural fill. If slow seepage is present, use of a rock blanket or a suitably revegetated, reinforced erosion control blanket may be required. PBS should be consulted if seepage is present; additional erosion control measures, such as additional drainage elements, and/or flatter slopes, may also be required. Exposed soils that are soft or loose may also require these measures. Fill slopes should be over-built and cut back into compacted structural fill at the design inclination using a smooth-bucket excavator. Erosion control is critical to maintaining slopes.

3.6 Ground Moisture

3.6.1 General

The perimeter ground surface and hard-scape should be sloped to drain away from all structures and away from adjacent slopes. Gutters should be tight-lined to a suitable discharge and maintained as free-flowing. All crawl spaces should be adequately ventilated and sloped to drain to a suitable, exterior discharge.

3.6.2 Vapor Flow Retarder

A continuous, impervious barrier must be installed over the ground surface in the crawl space and under slabs of all structures. Barriers should be installed per the manufacturer's recommendations.

3.7 Pavement Design

The provided pavement recommendations were developed using our experience with similar projects as well as the American Association of State Highway and Transportation Officials (AASHTO) design methods and references the associated Washington Department of Transportation (WSDOT) specifications for construction. Our evaluation considered a maximum of two trucks per day for a 20-year design life.

The minimum recommended pavement section thicknesses are provided in Table 4. Depending on weather conditions at the time of construction, a thicker aggregate base course section could be required to support construction traffic during preparation and placement of the pavement section.

Table 4. Minimum AC Pavement Sections

Traffic Loading	AC (inches)	Base Course (inches)	Subgrade
Drive Lanes and Access Roads	3	9	Stiff subgrade as verified by PBS personnel*

* Subgrade must pass proofroll

The asphalt cement binder should be selected following WSDOT SS 9-02.1(4) – Performance Graded Asphalt Binder. The AC should consist of ½-inch hot mix asphalt (HMA) with a maximum lift thickness of 3 inches. The AC should conform to WSDOT SS 5-04.3(7)A – Mix Design, WSDOT SS 9-03.8(2) – HMA Test Requirements, and WSDOT SS 9-03.8(6) – HMA Proportions of Materials. The AC should be compacted to 91% of the maximum theoretical density (Rice value) of the mix, as determined in accordance with ASTM D2041, following the guidelines set in WSDOT SS 5-04.3(10) – Compaction.

Heavy construction traffic on new pavements or partial pavement sections (such as base course over the prepared subgrade) will likely exceed the design loads and could potentially damage or shorten the pavement life; therefore, we recommend construction traffic not be allowed on new pavements, or that the contractor take appropriate precautions to protect the subgrade and pavement during construction.

If construction traffic is to be allowed on newly constructed road sections, an allowance for this additional traffic will need to be made in the design pavement section.

4 CONSTRUCTION RECOMMENDATIONS

4.1 Site Preparation

Construction of the proposed mini storage facility will involve clearing and grubbing of the existing vegetation or demolition of possible existing structures. In vegetated areas, site stripping should include removing topsoil, roots, and other deleterious materials to a minimum depth of 6 inches bgs. Demolition should include removing existing pavement, utilities, etc., throughout the proposed new development. Underground utility lines or other abandoned structural elements should also be removed. The voids resulting from removal of foundations or loose soil in utility lines should be backfilled with compacted structural fill. The base of these excavations should be excavated to firm native subgrade before filling, with sides sloped at a minimum of 1H:1V to allow for uniform compaction. Materials generated during demolition should be transported off site or stockpiled in areas designated by the owner's representative.

4.1.1 Proofrolling/Subgrade Verification

Following site preparation and prior to placing aggregate base over shallow foundation, floor slab, and pavement subgrades, the exposed subgrade should be evaluated either by proofrolling or another method of subgrade verification. The subgrade should be proofrolled with a fully loaded dump truck or similar heavy, rubber-tire construction equipment to identify unsuitable areas. If evaluation of the subgrades occurs during wet conditions, or if proofrolling the subgrades will result in disturbance, they should be evaluated by PBS using a steel foundation probe. We recommend that PBS be retained to observe the proofrolling and perform the subgrade verifications. Unsuitable areas identified during the field evaluation should be compacted to a firm condition or be excavated and replaced with structural fill.

4.1.2 Wet/Freezing Weather and Wet Soil Conditions

Due to the presence of fine-grained silt and sands in the near-surface materials at the site, construction equipment may have difficulty operating on the near-surface soils when the moisture content of the surface soil is more than a few percentage points above the optimum moisture required for compaction. Soils disturbed during site preparation activities, or unsuitable areas identified during proofrolling or probing, should be removed and replaced with compacted structural fill.

Site earthwork and subgrade preparation should not be completed during freezing conditions, except for mass excavation to the subgrade design elevations. We recommend the earthwork construction at the site be performed during the dry season.

Protection of the subgrade is the responsibility of the contractor. Construction of granular haul roads to the project site entrance may help reduce further damage to the pavement and disturbance of site soils. The actual thickness of haul roads and staging areas should be based on the contractors' approach to site development, and the amount and type of construction traffic. The imported granular material should be placed in one lift over the prepared undisturbed subgrade and compacted using a smooth-drum, non-vibratory roller. A geotextile fabric should be used to separate the subgrade from the imported granular material in areas of repeated construction traffic. Depending on site conditions, the geotextile should meet Washington State Department of Transportation (WSDOT) SS 9-33.2 – Geosynthetic Properties for soil separation or stabilization. The geotextile should be installed in conformance with WSDOT SS 2-12.3 – Construction Geosynthetic (Construction Requirements) and, as applicable, WSDOT SS 2-12.3(2) – Separation or WSDOT SS 2-12.3(3) – Stabilization.

4.1.3 Compacting Test Pit Locations

PBS understands the contractor backfilled test pits in compacted lifts by means of an excavator-mounted plate compactor. PBS did not monitor placement and compaction of backfill and understands density testing was not performed.

4.2 Excavation

The near-surface soils at the site can be excavated with conventional earthwork equipment. Sloughing and caving should be anticipated. All excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. The contractor is solely responsible for adherence to the OSHA requirements. Trench cuts should stand relatively vertical to a depth of approximately 4 feet bgs, provided no groundwater seepage is present in the trench walls. Open excavation techniques may be used provided the excavation is configured in accordance with the OSHA requirements, groundwater seepage is not present, and with the understanding that some sloughing may occur. Trenches/excavations should be flattened if sloughing occurs or seepage is present. Use of a trench shield or other approved temporary shoring is recommended if vertical walls are desired for cuts deeper than 4 feet bgs.

4.3 Structural Fill

Structural fill should be placed over subgrade that has been prepared in conformance with the Site Preparation and Wet/Freezing Weather and Wet Soil Conditions sections of this report. Structural fill material should consist of relatively well-graded soil, or an approved rock product that is free of organic material and debris, and contains particles not greater than 3 inches nominal dimension.

The suitability of soil for use as compacted structural fill will depend on the gradation and moisture content of the soil when it is placed. As the amount of fines (material finer than the US Standard No. 200 Sieve) increases, soil becomes increasingly sensitive to small changes in moisture content and compaction becomes more difficult to achieve. Soils containing more than about 5% fines cannot consistently be compacted to a dense, non-yielding condition when the water content is significantly greater (or significantly less) than optimum.

If fill and excavated material will be placed on slopes steeper than 5H:1V, these must be keyed/benched into the existing slopes and installed in horizontal lifts. Vertical steps between benches should be approximately 2 feet.

4.3.1 On-Site Soil

On-site soils encountered in our explorations are generally suitable for placement as structural fill for mass grading to raise the site during dry weather when moisture contents can be maintained by air drying and/or addition of water. The fine-grained fraction of the site soils are moisture sensitive, and during wet weather, may become unworkable because of excess moisture content. In order to reduce moisture content, some aerating and drying of fine-grained soils may be required. The material should be placed in lifts with a maximum uncompacted thickness of approximately 8 inches and compacted to at least 92% of the maximum dry density, as determined by ASTM D1557 (modified proctor).

4.3.2 Imported Granular Materials

Imported granular material used during periods of wet weather or for haul roads, building pad subgrades, staging areas, etc., should be pit or quarry run rock, crushed rock, or crushed gravel and sand, and should meet the specifications provided in WSDOT SS 9-03.14(2) – Select Borrow. In addition, the imported granular material should be fairly well graded between coarse and fine, and of the fraction passing the US Standard No. 4 Sieve, less than 5% by dry weight should pass the US Standard No. 200 Sieve.

Imported granular material should be placed in lifts with a maximum uncompacted thickness of 9 inches and be compacted to not less than 95% of the maximum dry density, as determined by ASTM D1557.

4.3.3 Base Aggregate

Base aggregate for floor slabs and beneath pavements should be clean crushed rock or crushed gravel. The base aggregate should contain no deleterious materials, meet specifications provided in WSDOT SS 9-03.9(3) – Crushed Surfacing Base Course, and have less than 5% (by dry weight) passing the US Standard No. 200 Sieve. The imported granular material should be placed in one lift and compacted to at least 95% of the maximum dry density, as determined by ASTM D1557.

4.3.4 Foundation Base Aggregate

Imported granular material placed at the base of excavations for spread footings, slabs-on-grade, and other below-grade structures should be clean, crushed rock or crushed gravel and sand that is fairly well graded between coarse and fine. The granular materials should contain no deleterious materials, have a maximum particle size of 1½ inch, and meet WSDOT SS 9-03.12(1)A – Gravel Backfill for Foundations (Class A). The imported granular material should be placed in one lift and compacted to not less than 95% of the maximum dry density, as determined by ASTM D1557.

4.3.5 Trench Backfill

Trench backfill placed beneath, adjacent to, and for at least 2 feet above utility lines (i.e., the pipe zone) should consist of well-graded granular material with a maximum particle size of 1 inch and less than 10% by dry weight passing the US Standard No. 200 Sieve, and should meet the standards prescribed by WSDOT SS 9-03.12(3) – Gravel Backfill for Pipe Zone Bedding. The pipe zone backfill should be compacted to at least 90% of the maximum dry density as determined by ASTM D1557, or as required by the pipe manufacturer or local building department.

Within pavement areas or beneath building pads, the remainder of the trench backfill should consist of well-graded granular material with a maximum particle size of 1½ inches, less than 10% by dry weight passing the US Standard No. 200 Sieve, and should meet standards prescribed by WSDOT SS 9-03.19 – Bank Run Gravel for Trench Backfill. This material should be compacted to at least 92% of the maximum dry density, as determined by ASTM D1557, or as required by the pipe manufacturer or local building department. The upper 2 feet of the trench backfill should be compacted to at least 95% of the maximum dry density, as determined by ASTM D1557.

Outside of structural improvement areas (e.g., roadway alignments or building pads), trench backfill placed above the pipe zone should consist of excavated material free of wood waste, debris, clods, or rocks greater than 6 inches in diameter and meet WSDOT SS 9-03.14 – Borrow and WSDOT SS 9-03.15 – Native Material for Trench Backfill. This general trench backfill should be compacted to at least 90% of the maximum dry density, as determined by ASTM D1557, or as required by the pipe manufacturer or local building department.

4.3.6 Stabilization Material

Stabilization rock should consist of pit or quarry run rock that is well-graded, angular, crushed rock consisting of 4- or 6-inch-minus material with less than 5% passing the US Standard No. 4 Sieve. The material should be free of organic matter and other deleterious material. WSDOT SS 9-13.1(5) – Quarry Spalls can be used as a general specification for this material with the stipulation of limiting the maximum size to 6 inches.

5 ADDITIONAL SERVICES AND CONSTRUCTION OBSERVATIONS

In most cases, other services beyond completion of a final geotechnical engineering report are necessary or desirable to complete the project. Occasionally, conditions or circumstances arise that require additional work that was not anticipated when the geotechnical report was written. PBS offers a range of environmental, geological, geotechnical, and construction services to suit the varying needs of our clients.

PBS should be retained to review the plans and specifications for this project before they are finalized. Such a review allows us to verify that our recommendations and concerns have been adequately addressed in the design.

Satisfactory earthwork performance depends on the quality of construction. Sufficient observation of the contractor's activities is a key part of determining that the work is completed in accordance with the construction drawings and specifications. We recommend that PBS be retained to observe general excavation, stripping, fill placement, footing subgrades, and/or pile installation. Subsurface conditions observed during construction should be compared with those encountered during the subsurface explorations. Recognition of changed conditions requires experience; therefore, qualified personnel should visit the site with sufficient frequency to detect whether subsurface conditions change significantly from those anticipated.

6 LIMITATIONS

This report has been prepared for the exclusive use of the addressee, and their architects and engineers, for aiding in the design and construction of the proposed development and is not to be relied upon by other parties. It is not to be photographed, photocopied, or similarly reproduced, in total or in part, without express written consent of the client and PBS. It is the addressee's responsibility to provide this report to the appropriate design professionals, building officials, and contractors to ensure correct implementation of the recommendations.

The opinions, comments, and conclusions presented in this report are based upon information derived from our literature review, field explorations, laboratory testing, and engineering analyses. It is possible that soil, rock, or groundwater conditions could vary between or beyond the points explored. If soil, rock, or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that PBS is notified immediately so that we may reevaluate the recommendations of this report.

Unanticipated fill, soil and rock conditions, and seasonal soil moisture and groundwater variations are commonly encountered and cannot be fully determined by merely taking soil samples or completing explorations such as test pits. Such variations may result in changes to our recommendations and may require additional funds for expenses to attain a properly constructed project; therefore, we recommend a contingency fund to accommodate such potential extra costs.

The scope of work for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, if conditions have changed due to natural causes or construction operations at or adjacent to the site, or if the basic project scheme is significantly modified from that assumed, this report should be reviewed to determine the applicability of the conclusions and recommendations presented herein. Land use, site conditions (both on and off site), or other factors may change over time and could materially affect our findings; therefore, this report should not be relied upon after three years from its issue, or in the event that the site conditions change.

7 REFERENCES

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

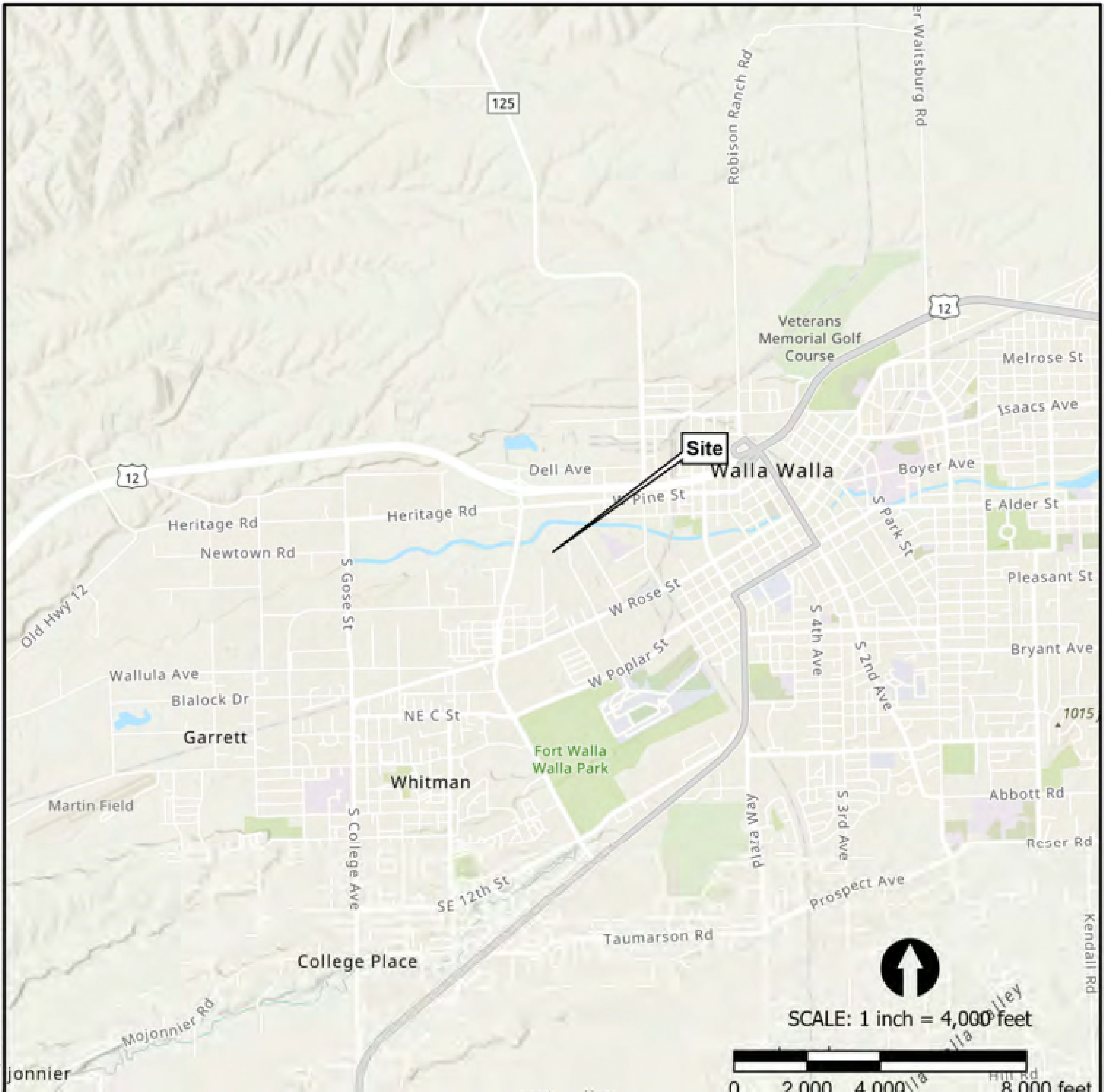
While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GBA GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733

e-mail: info@geoprofessional.org www.geoprofessional.org

Figures



VICINITY MAP

MYRA ROAD MINI-STORAGE FACILITY
WALLA WALLA, WASHINGTON

DATE: JAN 2023 · PROJECT: 67926.000

PBS

FIGURE

1

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EXPLANATION

- TP-1 - Test pit name and approximate location with infiltration test
- TP-3 - Test pit name and approximate location
- Approximate site boundary

Notes: Google Earth 2019 imagery

Coordinate System: NAD 1983 2011 StatePlane Washington South FIPS 4602 Ft US

SCALE: 1 inch = 150 feet

0 75 150 300 feet

SITE PLAN

MYRA ROAD MINI-STORAGE FACILITY
WALLA WALLA, WASHINGTON

DATE: JAN 2023 - PROJECT: 67926.000

PBS

FIGURE 2

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Appendix A
Field Explorations

Appendix A: Field Explorations

A1 GENERAL

PBS explored subsurface conditions at the project site by excavating eight test pits to depths of up to 10 feet bgs on January 6, 2023. The approximate locations of the explorations are shown on Figure 2, Site Plan. The procedures used to advance the test pits, collect samples, and other field techniques are described in detail in the following paragraphs. Unless otherwise noted, all soil sampling and classification procedures followed engineering practices in general accordance with relevant ASTM procedures. “General accordance” means that certain local excavation and descriptive practices and methodologies have been followed.

A2 TEST PITS

A2.1 Excavation

Test pits were excavated using a CAT 305.5E excavator equipped with a 36-inch-wide, smooth bucket provided and operated by Eagon Excavating & Construction Services, LLC, of Walla Walla, Washington. The test pits were observed by a member of the PBS geotechnical staff, who maintained a detailed log of the subsurface conditions and materials encountered during the course of the work.

A2.2 Sampling

Representative disturbed samples were taken at selected depths in the test pits. The disturbed soil samples were examined by a member of the PBS geotechnical staff and sealed in plastic bags for further examination.

A2.3 Test Pit Logs

The test pit logs show the various types of materials that were encountered in the excavations and the depths where the materials and/or characteristics of these materials changed, although the changes may be gradual. Where material types and descriptions changed between samples, the contacts were interpreted. The types of samples taken during excavation, along with their sample identification number, are shown to the right of the classification of materials. The natural water (moisture) contents are shown farther to the right. Measured seepage levels, if observed, are noted in the column to the right.

A3 MATERIAL DESCRIPTION

Initially, samples were classified visually in the field. Consistency, color, relative moisture, degree of plasticity, and other distinguishing characteristics of the soil samples were noted. Afterward, the samples were reexamined in the PBS laboratory, various standard classification tests were conducted, and the field classifications were modified where necessary. The terminology used in the soil classifications and other modifiers are defined in Table A-1, Terminology Used to Describe Soil.

PBS

Table A-1
Terminology Used to Describe Soil

Soil Descriptions

Soils exist in mixtures with varying proportions of components. The predominant soil, i.e., greater than 50 percent based on total dry weight, is the primary soil type and is capitalized in our log descriptions (SAND, GRAVEL, SILT, or CLAY). Smaller percentages of other constituents in the soil mixture are indicated by use of modifier words in general accordance with the ASTM D2488-06 Visual-Manual Procedure. "General Accordance" means that certain local and common descriptive practices may have been followed. In accordance with ASTM D2488-06, group symbols (such as GP or CH) are applied on the portion of soil passing the 3-inch (75mm) sieve based on visual examination. The following describes the use of soil names and modifying terms used to describe fine- and coarse-grained soils.

Fine-Grained Soils (50% or greater fines passing 0.075 mm, No. 200 sieve)
The primary soil type, i.e., SILT or CLAY is designated through visual-manual procedures to evaluate soil toughness, dilatency, dry strength, and plasticity. The following outlines the terminology used to describe fine-grained soils, and varies from ASTM D2488 terminology in the use of some common terms.

Primary soil NAME, Symbols, and Adjectives			Plasticity Description	Plasticity Index (PI)
SILT (ML & MH)	**CLAY (CL & CH)**	**ORGANIC SOIL (OL & OH)**		
SILT		Organic SILT	Non-plastic	0 – 3
SILT		Organic SILT	Low plasticity	4 – 10
SILT/Elastic SILT	Lean CLAY	Organic SILT/ Organic CLAY	Medium Plasticity	10 – 20
Elastic SILT	Lean/Fat CLAY	Organic CLAY	High Plasticity	20 – 40
Elastic SILT	Fat CLAY	Organic CLAY	Very Plastic	>40

Modifying terms describing secondary constituents, estimated to 5 percent increments, are applied as follows:

Description	% Composition	
With Sand	% Sand ≥ % Gravel	15% to 25% plus No. 200
With Gravel	% Sand < % Gravel	
Sandy	% Sand ≥ % Gravel	≤30% to 50% plus No. 200
Gravelly	% Sand < % Gravel	

Borderline Symbols, for example CH/MH, are used when soils are not distinctly in one category or when variable soil units contain more than one soil type. **Dual Symbols,** for example CL-ML, are used when two symbols are required in accordance with ASTM D2488.

Soil Consistency terms are applied to fine-grained, plastic soils (i.e., PI ≥ 7). Descriptive terms are based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586-84, as follows. SILT soils with low to non-plastic behavior (i.e., PI < 7) may be classified using relative density.

Consistency Term	SPT N-value	Unconfined Compressive Strength tsf	kPa
Very soft	Less than 2	Less than 0.25	Less than 24
Soft	2 – 4	0.25 – 0.5	24 – 48
Medium stiff	5 – 8	0.5 – 1.0	48 – 96
Stiff	9 – 15	1.0 – 2.0	96 – 192
Very stiff	16 – 30	2.0 – 4.0	192 – 383
Hard	Over 30	Over 4.0	Over 383

Soil Descriptions

Coarse - Grained Soils (less than 50% fines)

Coarse-grained soil descriptions, i.e., SAND or GRAVEL, are based on the portion of materials passing a 3-inch (75mm) sieve. Coarse-grained soil group symbols are applied in accordance with ASTM D2488-06 based on the degree of grading, or distribution of grain sizes of the soil. For example, well-graded sand containing a wide range of grain sizes is designated SW; poorly graded gravel, GP, contains high percentages of only certain grain sizes. Terms applied to grain sizes follow.

Material NAME	Particle Diameter	
	Inches	Millimeters
SAND (SW or SP)	0.003 – 0.19	0.075 – 4.8
GRAVEL (GW or GP)	0.19 – 3	4.8 – 75
Additional Constituents:		
Cobble	3 – 12	75 – 300
Boulder	12 – 120	300 – 3050

The primary soil type is capitalized, and the fines content in the soil are described as indicated by the following examples. Percentages are based on estimating amounts of fines, sand, and gravel to the nearest 5 percent. Other soil mixtures will have similar descriptive names.

Example: Coarse-Grained Soil Descriptions with Fines

>5% to < 15% fines (Dual Symbols)	≥15% to < 50% fines
Well graded GRAVEL with silt: GW-GM	Silty GRAVEL: GM
Poorly graded SAND with clay: SP-SC	Silty SAND: SM

Additional descriptive terminology applied to coarse-grained soils follow.

Example: Coarse-Grained Soil Descriptions with Other Coarse-Grained Constituents

Coarse-Grained Soil Containing Secondary Constituents	
With sand or with gravel	≥ 15% sand or gravel
With cobbles; with boulders	Any amount of cobbles or boulders.

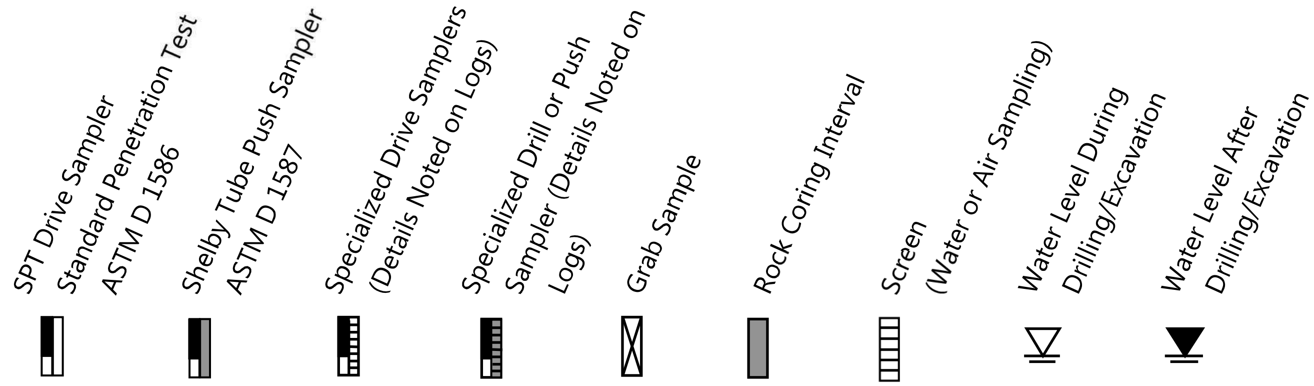
Cobble and boulder deposits may include a description of the matrix soils, as defined above.

Relative Density terms are applied to granular, non-plastic soils based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586-84.

Relative Density Term	SPT N-value
Very loose	0 – 4
Loose	5 – 10
Medium dense	11 – 30
Dense	31 – 50
Very dense	> 50

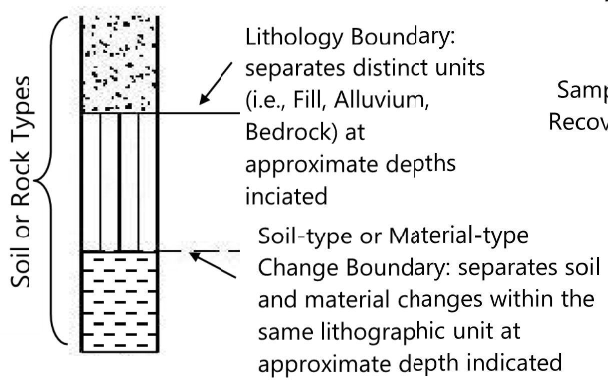
Table A-2
Key To Test Pit and Boring Log Symbols

SAMPLING DESCRIPTIONS

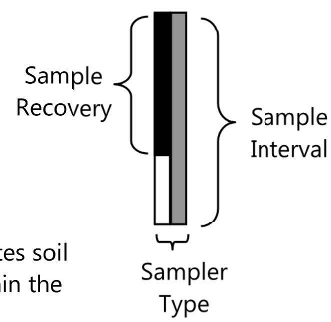


LOG GRAPHICS

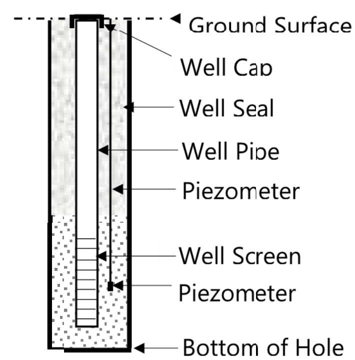
Soil and Rock



Sampling Symbols



Instrumentation Detail



Geotechnical Testing Acronym Explanations

PP	Pocket Penetrometer	HYD	Hydrometer Gradation
TOR	Torvane	SIEV	Sieve Gradation
DCP	Dynamic Cone Penetrometer	DS	Direct Shear
ATT	Atterberg Limits	DD	Dry Density
PL	Plasticity Limit	CBR	California Bearing Ratio
LL	Liquid Limit	RES	Resilient Modulus
PI	Plasticity Index	VS	Vane Shear
P200	Percent Passing US Standard No. 200 Sieve	bgs	Below ground surface
OC	Organic Content	MSL	Mean Sea Level
CON	Consolidation	HCL	Hydrochloric Acid
UC	Unconfined Compressive Strength		

Details of soil and rock classification systems are available on request.

	MYRA ROAD MINI-STORAGE FACILITY WALLA WALLA, WASHINGTON	**TEST PIT TP-1**
PBS	PBS PROJECT NUMBER: 67926.000	APPROX. TEST PIT TP-1 LOCATION: (See Site Plan) Lat: 46.06519 Long: -118.36752

Legend: ◆ DYNAMIC CONE PENETROMETER; ⊠ STATIC PENETROMETER; ● MOISTURE CONTENT % (scale 0 – 50 – 100)

Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.

Surface Conditions: Vegetation

DEPTH FEET	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE / SAMPLE ID	MOISTURE CONTENT %	COMMENTS
0.0	Dark brown, sandy SILT (ML); low plasticity; fine sand; moist	0.0				
2.0	fine, scattered roots to 2 feet bgs			S-1		Firm soil based on foundation probe resistance
4.0	becomes dry		P200	S-2	●	P200 = 75% Firm soil based on foundation probe resistance; infiltration testing completed at 4 feet bgs
7.0	Poorly graded GRAVEL (GP-GM) with silt, sand, and cobbles; non-plastic; fine to coarse sand; fine to coarse, rounded basalt gravel, dry	7.0		S-3		
9.0	Final depth 9.0 feet bgs; test pit backfilled with excavated material to existing ground surface. Groundwater not encountered at time of exploration.	9.0				

Depth scale: 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0

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COMPLETED: 1/06/2023

EXCAVATED BY: Eagon Excavating
EXCAVATION METHOD: CAT 305 Mini Excavator

FIGURE A1

PBS	MYRA ROAD MINI-STORAGE FACILITY WALLA WALLA, WASHINGTON	**TEST PIT TP-2**
	PBS PROJECT NUMBER: 67926.000	APPROX. TEST PIT TP-2 LOCATION: (See Site Plan) Lat: 46.06533 Long: -118.36714

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	◆ DYNAMIC CONE PENETROMETER STATIC PENETROMETER ● MOISTURE CONTENT % 0 50 100	COMMENTS Surface Conditions: Vegetation
0.0		Brown SILT (ML) with sand; low plasticity; fine sand; moist	0.0				
2.0		fine, scattered roots to 2 feet bgs			S-1		Firm soil based on foundation probe resistance
4.0		becomes dry		P200	S-2	●	P200 = 81% Soft soil based on foundation probe resistance; infiltration testing completed at 4 feet bgs
6.0							
		Poorly graded GRAVEL (GP) with sand; fine to coarse sand; fine to coarse, rounded basalt gravel, dry	7.0				
8.0					S-3		
		Final depth 9.0 feet bgs; test pit backfilled with excavated material to existing ground surface. Groundwater not encountered at time of exploration.	9.0				
10.0							
12.0							
14.0						0 50 100	

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COMPLETED: 1/06/2023

EXCAVATED BY: Eagon Excavating
EXCAVATION METHOD: CAT 305 Mini Excavator

FIGURE A2

	MYRA ROAD MINI-STORAGE FACILITY WALLA WALLA, WASHINGTON	**TEST PIT TP-3**
PBS	PBS PROJECT NUMBER: 67926.000	APPROX. TEST PIT TP-3 LOCATION: (See Site Plan) Lat: 46.06453 Long: -118.36732

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	◆ DYNAMIC CONE PENETROMETER STATIC PENETROMETER ● MOISTURE CONTENT % 0 50 100	COMMENTS Surface Conditions: Vegetation
0.0		Dark brown SILT (ML) with sand; low plasticity; fine sand; moist	0.0				
		fine, scattered roots to 1 foot bgs					
2.0					S-1		Firm soil based on foundation probe resistance
		becomes dry					
4.0					S-2		Firm soil based on foundation probe resistance
		6-inch ash lens					
6.0		moderate cementation					
8.0							
					S-3		
10.0		Final depth 10.0 feet bgs; test pit backfilled with excavated material to existing ground surface. Groundwater not encountered at time of exploration.	10.0				
12.0							
14.0							
						0 50 100	

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EXCAVATION METHOD: CAT 305 Mini Excavator

FIGURE A3

MYRA ROAD MINI-STORAGE FACILITY WALLA WALLA, WASHINGTON	**TEST PIT TP-4**
PBS PROJECT NUMBER: 67926.000	APPROX. TEST PIT TP-4 LOCATION: (See Site Plan) Lat: 46.06439 Long: -118.36683

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	◆ DYNAMIC CONE PENETROMETER STATIC PENETROMETER ● MOISTURE CONTENT % 0 50 100	COMMENTS Surface Conditions: Vegetation
0.0		Brown SILT (ML); low plasticity; moist	0.0				
		fine, scattered roots to 1 foot bgs					
2.0					S-1		Soft soil based on foundation probe resistance
4.0		moderate cementation		P200	S-2	●	P200 = 88% Firm soil based on foundation probe resistance
6.0							
8.0							
					S-3		
10.0		Final depth 10.0 feet bgs; test pit backfilled with excavated material to existing ground surface. Groundwater not encountered at time of exploration.	10.0				
12.0							
14.0						0 50 100	

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EXCAVATION METHOD: CAT 305 Mini Excavator

FIGURE A4

MYRA ROAD MINI-STORAGE FACILITY
WALLA WALLA, WASHINGTON

TEST PIT TP-5

PBS PROJECT NUMBER:
67926.000

APPROX. TEST PIT TP-5 LOCATION:
(See Site Plan)
Lat: 46.06493 Long: -118.36687

MATERIAL DESCRIPTION

Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.

◆ DYNAMIC CONE PENETROMETER
☒ STATIC PENETROMETER
● MOISTURE CONTENT % (0 – 50 – 100)

COMMENTS

Surface Conditions: Vegetation

DEPTH FEET	MATERIAL DESCRIPTION	DEPTH	TESTING	SAMPLE TYPE / SAMPLE ID	COMMENTS
0.0	Brown SILT (ML) with sand; low plasticity; fine sand; moist	0.0			
	fine, scattered roots to 1 foot bgs				
2.0				S-1	Firm soil based on foundation probe resistance
	3-inch gravel lens				
	becomes dry				
4.0				S-2	Firm soil based on foundation probe resistance
	orange mottling				
	Poorly graded GRAVEL (GP-GM) with silt, sand, and cobbles; non-plastic; fine to coarse sand; fine to coarse, rounded basalt gravel, dry	5.0			
6.0					
					Difficult digging
8.0				S-3	
	Final depth 8.5 feet bgs; test pit backfilled with excavated material to existing ground surface. Groundwater not encountered at time of exploration.	8.5			
10.0					
12.0					
14.0					

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EXCAVATION METHOD: CAT 305 Mini Excavator

FIGURE A5

MYRA ROAD MINI-STORAGE FACILITY
WALLA WALLA, WASHINGTON

TEST PIT TP-6

PBS PROJECT NUMBER:
67926.000

APPROX. TEST PIT TP-6 LOCATION:
(See Site Plan)
Lat: 46.06494 Long: -118.36597

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION (Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.)	DEPTH	TESTING	SAMPLE TYPE / SAMPLE ID	◆ DYNAMIC CONE PENETROMETER; STATIC PENETROMETER; ● MOISTURE CONTENT % (0 – 50 – 100)	COMMENTS (Surface Conditions: Vegetation)
0.0		Dark brown SILT (ML) with sand; low plasticity; fine sand; moist fine, scattered roots to 1 foot bgs	0.0				
2.0		Poorly graded GRAVEL (GP-GM) with silt, sand, and cobbles; non-plastic; fine to coarse sand; fine to coarse, rounded basalt gravel, moist	1.5		S-1		Dense soil based on foundation probe resistance
4.0					S-2		Dense soil based on foundation probe resistance Difficult digging
6.0							
8.0					S-3		
10.0		Final depth 8.5 feet bgs; test pit backfilled with excavated material to existing ground surface. Groundwater not encountered at time of exploration.	8.5				
12.0							
14.0							

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EXCAVATION METHOD: CAT 305 Mini Excavator

FIGURE A6

	MYRA ROAD MINI-STORAGE FACILITY WALLA WALLA, WASHINGTON	**TEST PIT TP-7**
	PBS PROJECT NUMBER: 67926.000	APPROX. TEST PIT TP-7 LOCATION: (See Site Plan) Lat: 46.06530 Long: -118.36640

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	✦ DYNAMIC CONE PENETROMETER ☒ STATIC PENETROMETER ● MOISTURE CONTENT % 0 50 100	COMMENTS Surface Conditions: Vegetation
0.0		Dark brown SILT (ML) with sand; low plasticity; fine sand; moist	0.0				
2.0		fine, scattered roots to 2 feet bgs			S-1		Firm soil based on foundation probe resistance
4.0		becomes dry			S-2		Firm soil based on foundation probe resistance
		Poorly graded GRAVEL (GP-GM) with silt and sand; non-plastic; fine to coarse sand; fine to coarse, rounded basalt gravel, dry	5.5				Difficult digging
6.0							
8.0					S-3		
		Final depth 9.0 feet bgs; test pit backfilled with excavated material to existing ground surface. Groundwater not encountered at time of exploration.	9.0				
10.0							
12.0							
14.0							

0 50 100

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EXCAVATED BY: Eagon Excavating
EXCAVATION METHOD: CAT 305 Mini Excavator

FIGURE A7

PBS	MYRA ROAD MINI-STORAGE FACILITY WALLA WALLA, WASHINGTON	**TEST PIT TP-8**
	PBS PROJECT NUMBER: 67926.000	APPROX. TEST PIT TP-8 LOCATION: (See Site Plan) Lat: 46.06533 Long: -118.36544

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION (Lines representing the interface between soil/rock units of differing description are approximate only, inferred where between samples, and may indicate gradual transition.)	DEPTH	TESTING	SAMPLE TYPE SAMPLE ID	◆ DYNAMIC CONE PENETROMETER ◼ STATIC PENETROMETER ● MOISTURE CONTENT % (0 – 50 – 100)	COMMENTS (Surface Conditions: Vegetation)
0.0		Dark brown SILT (ML) with sand; low plasticity; fine sand; moist	0.0				
		fine, scattered roots to 1 foot bgs					
2.0					S-1		Firm soil based on foundation probe resistance
		becomes light brown, with ash; dry					
4.0				P200	S-2	●	P200 = 81%
							Firm soil based on foundation probe resistance
		moderate cementation					Difficult digging
6.0							
		6-inch ash lens					
8.0		12-inch ash lens					
					S-3		
		Final depth 9.5 feet bgs; test pit backfilled with excavated material to existing ground surface. Groundwater not encountered at time of exploration.	9.5				
10.0							
12.0							
14.0							

0 50 100

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COMPLETED: 1/06/2023

EXCAVATED BY: Eagon Excavating
EXCAVATION METHOD: CAT 305 Mini Excavator

FIGURE A8